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N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A → B
Pressure → Ulcer

**Multicausality**

Years smoking → Heart disease
High fat diet → Heart disease
Limited exercise → Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  o Statistical conclusion validity
  o Internal validity
  o Construct validity
  o External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Is the primary purpose examination of relationships?

No

Descriptive Design

Will the sample be studied as a single group?

No

Correlational Design

Yes

Quasi-Experimental Study

Yes

Is the treatment tightly controlled by the researcher?

No

Will a randomly assigned control group be used?

No

Is the original sample randomly selected?

No

Experimental Study

Yes
Selecting a Descriptive Design

**Examining sequences across time?**
- **No**
  - One Group?
    - **No**
      - Comparative Descriptive Design
    - **Yes**
      - Descriptive Design
- **Yes**
  - Following same subjects across time?
    - **No**
      - Data collected across time
      - Cross-sectional design
    - **Yes**
      - Studying events partitioned across time?
        - **No**
          - Trend Analysis
        - **Yes**
          - Repeated measures of each subject
            - **Yes**
              - Longitudinal Study
            - **No**
              - Case Study
  - **Yes**
    - Single unit of study
      - Longitudinal Study
      - Cross-sectional design with treatment partitioning
      - Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

- Variable 1
- Description of Variable 1
- Interpretation of Meaning
- Development of Hypotheses

- Variable 2
- Description of Variable 2

- Variable 3
- Description of Variable 3

- Variable 4
- Description of Variable 4
A Comparative Descriptive Design

Group I
{variables measured} → Describe → Comparison of Groups on Selected Variables

Group II
{variables measured} → Describe

→ Interpretation of Meaning
→ Development of Hypotheses
Selecting the Type of Correlational Design

- **Describe relationships between/among variables?**
  - Descriptive correlational design

- **Predict relationships between/among variables?**
  - Predictive correlational design

- **Test theoretically proposed Relationships?**
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Description of variable

Research Variable 2

Development of Hypotheses

Research Design
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Research Design
Selecting The Type of Experimental Design

Pretest
- No
  - Post-test only control group design
- Yes
  - Repeated Measurements?
    - No
      - Examine effects of confounding variables?
        - No
          - Multiple sites?
            - Pretest/post-test control group design
        - Yes
          - Blocking?
            - No
              - Randomized clinical trials
            - Yes
              - Comparison of multiple levels of treatment
                - No
                  - Examination of complex relationships among variables in relation to treatment
                - Yes
                  - Nested Designs

Pretest-Post Test, Control Group Designs

| Randomly selected experimental group | PRETEST | TREATMENT | POST-TEST |
| Randomly selected control group     | PRETEST |           | POST-TEST |

Treatment: Under control of researcher

Findings:
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

Example:
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

Uncontrolled threats to validity:
- Testing

Instrumentation
- Restricted generalizability as control increases
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of independent variables</td>
<td>Measurement of dependent variables</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Treatment:** Under control of researcher
- **Findings:** Comparison of experimental and control groups
- **Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
## Nested Design

### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
<td>Unit F</td>
<td>Unit G</td>
<td>Unit H</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
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Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design